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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,247	02/18/2004	Chou San Nelson Loke	ASMJP.145AUS	3140

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EXAMINER

CHEN, KEATH T

ART UNIT	PAPER NUMBER
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1792

NOTIFICATION DATE	DELIVERY MODE
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03/24/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/781,247	Applicant(s) LOKE ET AL.	
	Examiner KEATH T. CHEN	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 23-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 23-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 03/05/2009 has been entered.

Response to Amendment

1. The claim amendment filed on 02/24/2009, addressing claims 1-8 and 23-29 rejection from the final office action (12/26/2008) by amending claims 1 and 6 is entered, and will be addressed below.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-8 and 23-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 recites “where the showerhead is more irradiated with electromagnetic waves from the electromagnetic wave generator than are all other walls of the reactor”. There is no disclosure how the showerhead is more irradiated with electromagnetic waves from the electromagnetic wave generator than the walls that are closer to the electromagnetic wave generator.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35 U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 6, and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cox et al. (US 6418874, hereafter '874), in view of Otsubo et al. (US 4776918, hereafter '918) and Herchen (US 6502529, hereafter '529).

'874 teaches some limitations of claim 1:

A thin-film deposition system (Fig. 1, #10) comprising: an evacuable (by pump #82, col. 5, line36) plasma CVD reactor (region enclosed by bottom plate #60 and side wall #14) comprising a susceptor (substrate support member #72, col. 5, line 18) and a showerhead (a gas delivery ring with a series of nozzles at the chamber top, col. 6, lines 35-38); an RF power generator (#28, toroidal plasma source) arranged outside (above bottom plate #60) the plasma CVD reactor, connected to he showerhead for forming plasma discharge (bias generator #86 is capable of forming/assisting in forming plasma discharge by adjusting power) between the susceptor and showerhead (plasma is between susceptor and showerhead, col. 3, lines 56-58); a remote plasma chamber (reactor cavity #108, col. 6, lines 49-50) arranged outside the plasma CVD reactor

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(#104, col. 6, lines 44-46), for providing active species to an interior of the plasma CVD reactor (col. 6, lines 46-52); and an electromagnetic wave generator (bias generator #86, col. 6, line 13) arranged outside the plasma CVD reactor (as shown in Fig. 1), the RF power generator (#86), and the remote plasma chamber, for emitting electromagnetic waves to the interior of the reactor (toroidal plasma source is to provide energy to the interior of the reactor) for cleaning an inner surface of the reactor and the showerhead (col. 2, lines 30-32; chamber interior including showerhead surfaces).

Applicant's claim requirement "for cleaning an inner surface of the reactor" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

'874 does not teaches the other limitation of:

Claim 1: (a susceptor and a showerhead) which are lower and upper electrodes capacitively coupled for forming plasma discharge therebetween; said electromagnetic wave generator being connected to a side wall of the reactor at a position between the showerhead and the susceptor where the showerhead is more irradiated with

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electromagnetic waves from the electromagnetic wave generator than are all other walls of the reactor.

'918 is an analogous art in the field of fabrication of semiconductor devices using low temperature plasma (field of the invention; similar to '874, col. 1, lines 5-9), particularly in high density uniform plasma (col. 2, lines 58-62; similar to '874, col. 2, lines 20-23). '918 teaches (see Fig. 11) a capacitively coupled electrodes between susceptor (electrode/table #7, col. 9, line 32) and showerhead (gas supply tube #9' and the slit plate 5', together, is a showerhead, col. 9, lines 26-31; see also col. 3, lines 47-50) along with microwave power (Fig. 11, magnetron #3 and waveguide #2, col. 4, line 49).

'529 is an analogous art in the field of semiconductor wafer processing using plasma (col. 3, line 52), particularly in efficiently coupling electromagnetic energy to energize a gas for processing a substrate (col. 1, lines 50-51). '529 teaches electromagnetic energy source (#150, Fig. 1, col. 4, lines 21-27, including microwave, col. 3, line 59) to the side wall of the reactor at a position between the showerhead (gas distributor #85, col. 3, line 58) and the susceptor (support #70, col. 3, line 54) and close to the showerhead (#85) similar to Applicants' apparatus (#6 of Fig. 1), and therefore to have the property "where the showerhead is more irradiated with electromagnetic waves from the electromagnetic wave generator than are all other walls of the reactor".

When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562

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F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '918 with '874. Specifically, to have replaced the toroidal source #28 in Fig. 1 of '874 with a slit plate/showerhead with gas supply as taught by '918 for the purpose/motivation of high density uniform plasma (col. 3, lines 52-53). Additionally, to have arranged the microwave electromagnetic energy source to the side wall closer to the showerhead, as taught by '529 (Fig. 1), to the apparatus in Fig. 1 of '874, for the purpose/motivation of limiting heating of the gas energizing components, as taught by '529 (col. Lines 52-53).

Note '918's showerhead is to augment that a showerhead can be connected below a microwave source, in case Applicant argue that '874's a series of nozzles at the chamber top (col. 6, lines 35-38) is not a showerhead.

'874 further teaches the limitation of:

Claim 6: The system according to Claim 1, further comprising a controller (#44, col. 4, line 11) which is set to activates the electromagnetic wave generator (#28, through connection of RF generator #20 and leads 24, 26 to ferrite core #22A, col. 10, lines 29-31) only for reactor cleaning (col. 2, lines 26-28, controller is capable of being set to activate #28 only for reactor cleaning because the timing and the level of RF power is controlled, col. 7, lines 5-7) and which activates the electromagnetic wave

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generator only for reactor cleaning (remote plasma cleaning system #104, col. 6, lines 44-52 is set for cleaning only).

Claim 26: The system according to claim 1, wherein the electromagnetic waves have power (3-5 kW, col. 5, lines 55-56) effective to facilitate the cleaning of the inner surface of the reactor.

Applicant's claim requirement "to facilitate the cleaning of the inner surface of the reactor" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 27: The system according to claim 26, wherein the electromagnetic waves have power in the range of 100-5,000 W (3-5 kW, col. 5, lines 55-56).

4. Claims 2-4, 7-8, 23, and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over '874, '918, and '529, further in view of Kabansky (US 20020179248, hereafter '248).

'874, '918, and '529, together, teach all limitations of claim 1, as discussed above. '874 further teaches the RF frequency for the generator #20 at 200 MHz (0.2

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GHz) and connected from the top of the chamber. '874 criticizes the erosion of dome by the coil affecting the through-put of the plasma system (col. 2, lines 1-19).

'874, '918, and '529, together, do not explicitly teach the limitations of:

Claim 2: The system according to claim 1, wherein the electromagnetic waves are microwaves.

Claim 3: The system according to claim 1, wherein the reactor and the electromagnetic wave generator are connected by a waveguide.

Claim 4: The system according to claim 1, wherein the reactor comprises a sapphire window where the waveguide is connected.

Claim 7: The system according to claim 1, wherein the electromagnetic wave generator is connected to a side wall of the reactor in a direction perpendicular to an axis of the susceptor and the showerhead.

Claim 23: The system according to claim 2, wherein the microwaves have a wave length effective to facilitate cleaning of the inner surface of the reactor.

Applicant's claim requirement "to facilitate cleaning of the inner surface of the reactor" is considered intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is

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capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Claim 28: The system according to claim 7, wherein the reactor and the electromagnetic wave generator are connected by a waveguide.

Claim 29: The system according to Claim 28, wherein the reactor comprises a sapphire window where the waveguide is connected.

'248 is an analogous art in the field of semiconductor wafer processing including cleaning (abstract, '874, col. 2, lines 30-32), particularly in reducing particles ([0014], '874, col. 2, line 16) and a dual power (Fig. 2, microwave #142 and RF #174; '874, toroidal plasma #28 and RF bias #86) apparatus for simultaneous application to the wafer ('248, abstract). '248 provides a microwave power and gas delivery set up that increases the lifetime of the hardware ([0014]), a feature that '874 desired. '248 provides a microwave generator (#142) connected to a wide wall (#160, see [0038]) through a waveguide (#144, [0027]) and the outlet (#152, [0028]) of sapphire ([0041]) plasma tube (#146, [0028]) to facilitate the dual power application to the wafer.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '248 with '874, '918, and '529. Specifically, to have replaced the toroidal source #28 in Fig. 1 of '874 with a microwave plasma system as taught by '248 for its suitability for the dual power application. Note that the sapphire

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tube (#146) is a sapphire window (transparent) that connected to the waveguide (#144).

For claim 23, any microwave wave length is considered effective wave length.

Motivation to combine would have been the suitability use the plasma power source. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, U.S. 327, 65 USPQ 297 (1945).

'874 further teaches the remote plasma system is a microwave plasma, but is silent whether it is capacitive or inductive.

'874 does not explicitly teaches the limitation of:

Claim 8: The system according to claim 1, wherein the remote plasma generates an inductively-coupled plasma.

'248 teaches the remote plasma can be an inductively coupled plasma or a microwave plasma ([0005]).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined adopted an inductively coupled remote plasma, as taught by '248, in the apparatus in Fig. 1 of '874 for its suitability.

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The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, U.S. 327, 65 USPQ 297 (1945).

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over '874, '918, and '529, further in view of '248 and Houchin et al. (US 5202095, hereafter '095).

'874, '918, and '529, together, teaches limitations of claim 1, as discussed above. '874, '918, '529, and '248, together, teach replacing toroidal source with a microwave system, as discussed above.

'874, '918, '529, and '248, together, do not teach the limitation of claim 5:

The reactor and the electromagnetic wave generator are connected by a co-axial cable.

'095 is an analogous art in the field of semiconductor plasma etching (field of invention), particularly in solving the problem of processing uniformity (col. 1, lines 43-50, '874, col. 2, lines 42-46). '095 teaches the use of coaxial cables being more advantageous over the use of waveguides for the purpose of miniaturization (col. 2, lines 20-22).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '095 with '874, '918, '529, and '248.

Specifically, to have replaced the waveguide (#144) in the microwave system in the

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apparatus in Fig. 2 of '248 with coaxial cable (and then combined with Fig. 1 of '874), for the purpose of miniaturization. Note that the replacement with cable would not be a problem to the gas hole for the plasma into outlet #152.

6. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over '874, '918, '529, and '248, further in view of Yanase (US 20020117473, hereafter '473).

'874, '918, '529, and '248, together, teach all limitations of claim 23, as discussed above. '248 is silent on the wave length and frequency of the microwave.

'874, '918, '529, and '248, together, do not explicitly teach the limitations of:

Claim 24: The system according to claim 23, wherein the microwaves have a wave length of 3×10^{-4} to 3×10^{-1} m or a frequency of 1 to 1000 GHz.

Claim 25: The system according to claim 24, wherein the microwaves have ultrahigh frequencies of 0.3-3 GHz.

'473 is an analogous art in the field of cleaning plasma etching apparatus (field of invention), particularly in solving the problem quartz etching during microwave introduction containing fluorine ([0011]), the same problem '248 is solving ([0014]). '473 teaches microwave frequency of 2.45 GHz ([0049], lines 10-11).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have combined '473 with '874, '918, '529, and '248.

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Specifically, to have adopted microwave frequency of 2.45 GHz in the MW power generator (#142) in Fig. 2 of '248 (and then combined with '874) for its suitability.

The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, U.S. 327, 65 USPQ 297 (1945).

Response to Arguments

Applicant's arguments filed on 02/24/2009 have been fully considered but they are not persuasive.

7. Applicant's amendment of claims 1 and 6 overcome previous 35 USC 112 first paragraph new matter rejection. However, the newly added limitation of claim 1 raised new issue on 35 USC 112 first paragraph enablement rejection, see rejection above.

8. In regarding to 35 USC 103 rejection of claims 1, 6, 26-27 based on '874, '918, and '529, Applicants arguments are:

a) '874's bias generator is connected to susceptor and connecting #28 with #86 will make '874 inoperative, see the first paragraph.

This argument is found not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The rejection is based on '874, '918, and '529. '874 teaches three plasma source/RF generator, two of which are remote plasma (#86, #26, #108) connected to showerhead and susceptor.

Furthermore, '918 specifically teaches capacitively coupled plasma between showerhead and susceptor with microwave generator above showerhead. It clearly teaches that the RF generator can be connected to the showerhead.

The rejection in the section of 35 USC 103 rejection above further clarifies the mapping of these RF generators.

b) none of the '874, '918 and '529 teaches the new claim limitations "where the showerhead is more irradiated with electromagnetic waves from the electromagnetic wave generator than are all other walls of the reactor", see the bottom half of page 5.

This argument is found not persuasive.

The examiner maintains that '529 have the structure as Applicants' apparatus and therefore, the same properties as Applicants' claim.

When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T. C./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792